



Building Higher Education Curricula Fit for the Future

How higher education institutions are responding to the
Industrial Strategy

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In partnership with:



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University

Anglia Learning & Teaching
**Centre for Innovation
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Foreword

The focus of the UK's Industrial Strategy on supporting people to develop for jobs of the future, as well as how best to understand and articulate their employability development, speaks directly to effective learning and teaching in a Higher Education setting. If up to 70% of the anticipated 1.8 million new jobs in the UK that will be created between 2014 and 2024 will be in occupations most likely to employ graduates, then the career readiness and employability of students across all disciplines within HE will continue to grow in importance as an area of curriculum design and development.

To better understand the relationship between the evolving economic terrain set out in the UK's Industrial Strategy and the development of employability provision that will respond effectively to national needs, further research into the role HE plays in creating programmes of study that connect with this agenda was necessary.

In commissioning this research, AdvanceHE set out to inform the sector's understanding about how the vision detailed in the UK's Industrial Strategy is articulated through approaches to learning and teaching in HE and to contribute to policy debates in this area around academic and technical qualifications.

The research looks across discipline areas in order to provide deeper and richer insights into how employability and skills development are understood and developed within HE – identifying representative examples and case studies. The research focuses on the ways in which corresponding and connected terms function in this arena – such as competency, aptitude, proficiency and attribute – in order to scrutinise the language of employability.

Through the project's analysis of the employability landscape across discipline areas within HE, it also adds to the debates about a "national employability skills framework" and the Fourth Industrial Revolution.

Dr Ben Brabon

Academic Lead, AdvanceHE

1. Executive summary

The vision outlined in the government's *Industrial Strategy – Building a Britain Fit for the Future* (2017) has significant implications for employability and skills development in higher education (HE). HE providers have a vital role to play in the design and delivery of curricula that support their students to realise their ambitions.

This small-scale study was conducted by researchers at the Centre for Innovation in Higher Education (CIHE) at Anglia Ruskin University. It set out to explore and analyse the role HE plays in creating programmes of study that connect with the agenda set out in the *Industrial Strategy*, and support the development of employability provision that will respond effectively to national needs.

The study looked across UK HE institutions and discipline areas in order to provide deep and rich insights into how 'employability' and 'skills development' are understood and 'taught' within HE. It includes case studies of how HE providers are addressing the vision set out in the government's *Industrial Strategy*, articulating and sharing good practice in learning and teaching at a variety of HE institutions. Through the project's analysis of the employability topography across discipline areas within HE, it aims to further add to the debates about a 'national employability skills framework'.

2. Headline recommendations

The skills required by the *Industrial Strategy* extend beyond STEM subjects.

- + Develop a broader collective vision that looks beyond STEM subjects to recognise the creative and innovative possibilities fostered in graduates of all disciplines
- + Explore how to capitalise on the transferable skills and meta-competencies of graduates in all disciplines to implement the vision of the *Industrial Strategy*

Technical and academic knowledge are closely interconnected.

- + Research the impact of separating academic, technical and vocational routes at secondary level and in further/higher education, with particular regard to the successful realisation of the *Industrial Strategy*
- + Devise a means for government, industry and the higher education sector to work together to design a lifelong skills approach encompassing technical, conceptual, reflective and innovative capabilities across the whole workforce
- + Invite senior leaders from higher education institutions (including alternative providers and college HE) who are already using active, experiential and reflective teaching strategies in their curricula to join the Post-16 Skills Plan independent panel

Lifelong reskilling opportunities will need ‘buy-in’ from all stakeholders.

- + Ensure both higher education institutions and employers are supported to share responsibility for enabling access to flexible, lifelong reskilling

A shared language of employability has yet to emerge.

- + Build on successful educational collaborations and conversation between employers and higher education institutions to develop a meaningful and nuanced terminology that articulates attributes and values as well as skills, and takes into account the differences in how these may be applied in various sectors
- + Expand this conversation to include the views of other stakeholders: students, local enterprise partnerships and government

Higher education teaching has a unique role in transferable skills development.

- + Conduct more extensive research to establish:
 - a fuller review of existing literature in the field
 - what proportion of the HE sector is employing innovative teaching methods for integrating academic and applied learning
 - further evidence of how these methods connect with and actively foster the skills and attributes that employers will seek in a rapidly changing employability landscape

3. About this study

3.1 Research background and aims

In May 2018 the Centre for Innovation in Higher Education (CIHE), Anglia Ruskin University, was commissioned to explore and analyse the role that higher education plays in creating programmes of study that connect with the agenda set out in the *Industrial Strategy*, and support the development of employability provision that will respond effectively to national needs.

The study set out to explore the following research questions:

1. In what ways is the *Industrial Strategy* influencing and informing questions of programme design and delivery in HE?
2. In what ways are HE providers taking into account the *Industrial Strategy* through their curricula and approaches to learning and teaching?
3. How is employability development within an HE setting responding to the broader context of the *Industrial Strategy*?
4. What evidence is there to suggest that employability development within HE is cogent and aligned with the national needs outlined in the *Industrial Strategy*?

3.2 Method

In the first phase of the study the project researchers carried out a search of the academic literature on Google and Google Scholar to produce a short literature review of key publications and texts pertinent to the project. They also conducted a search of UK HEI websites (including college HE and alternative providers) for all mentions of the *Industrial Strategy* from 2017 to present.

The second phase comprised one-hour individual interviews with senior HE leaders and course leaders, designed to gauge awareness of, and engagement with, the *Strategy* at strategic and curricular level and explore how HEIs are responding in the design of their teaching and learning activities. Ethical approval was obtained from Anglia Ruskin University's Research Ethics Panel (protocol number FHSCE-DREP-17-220).

Participants were recruited in the first instance by way of Advance HE's mailing list for Pro Vice-Chancellors. Further invitations were sent directly to selected Pro Vice-Chancellors (or equivalent role) at institutions showing a high level of engagement with the *Industrial Strategy* as demonstrated in the literature and web search. During interview, the senior leaders were requested to introduce the researchers to a programme leader or course designer conducting innovative work on embedding employability skills into academic teaching and learning.

3.3 Analysis

The researchers used an emergent thematic coding method to analyse the interview data. Analysis commenced on completion of the first interview and continued throughout the data collection phase. The interview data were reviewed repeatedly and codes were assigned to discrete meaningful units of text (paragraphs, sentences or phrases) capturing granular aspects of how higher education institutions (HEIs) are responding to the *Industrial Strategy* and its broader context.

The codes and data were reviewed iteratively over the course of the analysis and clustered into related groups comprising higher-level categories. From these categories a number of major themes emerged, which are explored in section 6.

4. List of interviewees and institutions

Anglia Ruskin University

Prof Iain Martin, Vice Chancellor

Dr Alison Pooley, Senior Lecturer and Course Leader for BA (Hons) Architecture

Aston University

Prof Helen Higson, Provost and Deputy Vice Chancellor

Dr Kate Sugden, Associate Dean for Enterprise

Cranfield University

Prof Lynette Ryals, Pro Vice-Chancellor Education (to April 2018); Director, School of Management and Programme Director, MK:U

Prof Emma Sparks, Professor of Systems Engineering Education

Dr Toby Thompson, Networked Learning Director, Cranfield School of Management

Nottingham Trent University

Michael Carr, Pro Vice-Chancellor Employer and Economic Engagement

Fiona Anderson, Economic Partnerships Manager

Dr Jane Challinor, Principal Lecturer in Social Sciences and subject lead for Health and Social Care

SAE Institute

Lee Erinmez, Music Business Programme Co-ordinator

University of Cumbria

Prof Andrew Gale, Director of Industrial Strategy, Professional Development & Skills; Professor Emeritus, University of Manchester

University of Hertfordshire

Dr Sal Jarvis, Pro Vice-Chancellor Education and Student Experience

Thomas Baker, Associate Dean (Learning, Teaching and Student Experience), School of Engineering and Technology

WCG (Warwickshire College Group)

Steve Taylor, Dean of Higher Education

The researchers offer grateful thanks to all the interviewees for their generosity in giving their time and insights to inform this study.

5. Introduction

5.1 The *Industrial Strategy* and the higher education sector

The UK Government's *Industrial Strategy*, published in November 2017, sets out a vision for the future workforce and employment needs of the nation. Its critical objective is "to improve living standards and economic growth across the country" (2017, p.29). The *Strategy* aims to boost productivity and earning power nationally, identify new ways of building innovation excellence, and provide a blueprint for securing the UK's future after leaving the European Union.

The *Industrial Strategy* positions the higher education sector as crucial to this vision in two main ways:

- universities and colleges are a source of research expertise that can, in closer collaboration with industry, generate world-class innovation (p.67, 84)
- higher education is key to addressing the shortage of STEM (defined in the *Strategy* as science, technology, engineering and mathematics) subjects that currently risks impeding UK productivity (p.97)

It envisages a knowledge-led economy in which university-led 'innovation clusters' will create skilled jobs "driven by the growth in science, technology, engineering and mathematics (STEM) skills led by new teachers and more doctorates" (p.67). This vision of higher education as a springboard for innovative research and development is closely linked to the Grand Challenges around artificial intelligence and data, clean growth, the future of mobility, and the ageing society, which will drive applied research in the Fourth Industrial Revolution.

5.2 Skills for the Fourth Industrial Revolution

"This fourth industrial revolution is of a scale, speed and complexity that it is unprecedented It will disrupt nearly every sector in every country, creating new opportunities and challenges for people, places and businesses to which we must respond."

HMG, *Industrial Strategy*, p.32

The *Strategy* acknowledges a need for significant reskilling of the population. It recognises the need to ensure individuals have lifelong access to upskilling opportunities across all sectors, ensuring "that everyone can improve their skills throughout their lives, increasing their earning power and opportunities for better jobs" (p.94).

At a detailed level, the *Strategy* focuses in particular on digital skills, committing to "equip citizens for jobs shaped by next generation technology" (p.94). This will be achieved by creating a National Centre for Computing Education and an adult digital skills entitlement that will offer basic training (p. 40-1). A new National Retraining Scheme designed to help people upskill as the economy changes will also focus initially on digital skills as a priority (p.41).

This strong focus on digital skills mirrors a broader concern about the extent of STEM expertise available in the UK. The *Strategy* acknowledges that insufficient attention has been paid to nurturing technical education, declaring bluntly that "We do not have enough people skilled in science, technology, engineering and maths" (p.94).

To address this crucial skills gap the government has promised to establish a world-class technical education system that will "stand alongside our world-class higher education system" (p.94). Degree-level apprenticeships are the first step in this undertaking. With the creation of a new technical-based qualification, T-Levels (which will be available from 2020), individuals will be invited to make an "informed choice between technical or academic education" (p.102).

The government's Post-16 Skills Plan places this choice midway through secondary school: "After they have completed their GCSEs [mandatory exams taken at age 16], students will have to choose whether to take an

academic or technical pathway” (Exley, 2016). The *Strategy* is thus built on an education system that makes a clear distinction between technical and academic learning, with discrete pathways into and through each stream of education.

5.3 The accelerating pace of change

Against the swiftly evolving backdrop of the Fourth Industrial Revolution, new jobs and new skills are emerging. The World Economic Forum’s in-depth 2016 report *The Future of Jobs* offers convincing evidence that

Some jobs will disappear, others will grow and jobs that don’t even exist today will become commonplace. What is certain is that the future workforce will need to align its skillset to keep pace. (Gray, 2016)

The WEF has predicted “dramatic shifts in expected skills requirements” (2016, p.21). By 2020 more than 36% of all jobs across all industries are expected to require complex problem-solving as a core skill (p.21), while social skills such as persuasion, emotional intelligence and teaching others will be in more demand than specialist technical skills (p.22).

Similarly, the Universities UK report *Solving Future Skills Challenges* (2018) notes that the jobs of the future are likely to require “higher level skills”, which it defines as

a greater ability to understand increasingly complex subject matter, [and] also the ability to evaluate, analyse, interrogate and present the subject matter, and ... create original knowledge. (p.4)

As we have seen, the *Industrial Strategy* places significant emphasis on the development of digital, technical and technological skills. However, the Taylor Review of modern working practices (2017) highlights the importance of specifically non-technical abilities - “Human perception, creativity and social intelligence are all key components of tasks that currently lie outside the domain of robots” - and proposes that “further importance could be assigned to non-cognitive skills such as relationship-building, empathy and negotiation” (p.31).

Indeed, in a world that looks set to be dominated by artificial intelligence and machine learning, the Taylor Review argues that “The challenge is to develop new skills not targeted by automation” (p.31). This observation suggests that employers and industry have a responsibility to be proactive in identifying and supporting certain skills, rather than waiting for them to emerge in response to changing economic and technological drivers: “Employers need to think hard about how they are designing jobs that will complement increased automation” (2017, p.85).

5.4 What this means for the higher education sector

This unprecedentedly rapid evolution in workplace skills means that HE institutions, like their graduates, will have to respond in a creative and agile manner:

a greater ability to understand and embrace change along with the ability to adapt and think creatively will be necessary. The scale and pace of change requires something different from universities. (Stuart and Shutt, 2018)

The Vice Chancellor of Anglia Ruskin University, Iain Martin (who participated in this study as an interviewee) recently wrote about the need for the HE sector to offer different, more flexible learning opportunities and qualification structures:

whilst the initial post-18 qualification will continue to be the foundation upon which careers are built, there is an increasing need for the delivery of flexible, just-in-time postgraduate credentials and qualifications that allow movement into the new roles that the fourth industrial revolution will bring. (Martin, 2018)

Tholen (2018) warns that already a gap has opened between what employers need and what universities provide, arguing that “new graduate occupations have emerged in which the skills demanded by employers and to perform the work are not necessarily aligned with the skills and knowledge HE imparts” (p.1). In a

study of four graduate occupations, Tholen interviewed workers, employer and stakeholders about their perceptions of how well higher education had developed employees' skills and knowledge for the workplace. He raised the issue of a possible "skills mismatch", noting that "there are many graduate workers who are working in jobs in which they were not formally trained" (2018, p.2).

Helen Higson of Aston University contributed a chapter to the 2012 Wilson Review of business-university collaborations, and has also contributed to this report as a participant. She acknowledges that during the Wilson Review,

[w]e were acutely aware that the perception of universities' ability to provide employers with graduates with the skills they sought was not strong.

There was an impression that universities were not attuned to business needs, but rather were internally focussed, running degrees that the institutions wanted instead. Universities were often regarded as out of touch with business, unable to speak their language. (Higson, 2018)

As Tholen notes, employers value professional expertise and the knowledge and skills needed to solve occupation-specific problems more than what he refers to as "general academic skills", which are not seen as crucial for hiring. Although employers believed that both types of skill should be taught in higher education courses, they felt that the occupation-specific skills should be taught through 'real' work practices in the curriculum (Tholen, 2018, p.2).

5.5 How the higher education sector is responding

The researchers found a significant degree of awareness of the *Industrial Strategy* across the HE sector, across institutions from all mission groups.

The literature and website searches yielded a wide range of responses to the *Strategy*, including policy reports; blog posts about universities' role in their regional economies; events and briefings for researchers about the *Strategy* and the Grand Challenges; breakfast meetings bringing together researchers and industry partners to spark innovative collaboration and knowledge exchange; and even the creation of new strategic roles. Several responses appeared on or shortly after 27 November 2017, the publication date of the *Industrial Strategy*, evidencing the sector's proactive approach and its preparedness for the *Strategy*.

Indeed, much work evident in HEIs today predates the publication of the *Strategy*. A post by Latham for the WonkHE blog notes that

[t]he incoming executive chair of Research England has described the industrial strategy as a "vote of confidence" in universities. He is absolutely right. But it also puts even more responsibility on universities to remind government and our own regions how much we are already doing and how well set up we are to get these plans up and running immediately. (Latham, 2017)

Higson echoes this point:

Collaborations and partnerships saw the co-design of degrees, integrated work experience on all degrees, work shadowing for university staff, encouraging more students to undertake outward mobility overseas, promoting graduate internships, more opportunities to reflect on employability skills, and a new focus on the employability of postgraduate taught and research students (2018)

She concludes that:

All of these were already happening in many institutions five years ago. Looking at the landscape today it is clear that the situation is even stronger. (Higson, 2018)

The interviews conducted for this study yielded extensive data on how HEIs are responding to the needs of the *Strategy*. Again, it is evident that many of the initiatives described in section 6 were in place or projected prior to the publication of the *Strategy*, suggesting that parts of the HE sector had already begun to make alterations to both their curricula and strategic positioning in order to provide employability provision that responds effectively to evolving national needs.

It should be noted that the participants in this study were self-selecting: as outlined above, they responded to an invitation sent to Advance HE's Pro Vice-Chancellor mailing list, or to individual emails. It follows that they were already aware of the *Industrial Strategy* and using innovative teaching methods and curriculum design in order to accommodate its goals. All the responding institutions identify with newer mission groups.

The participating institutions share a particular set of strategic characteristics. Notably, they are all well embedded in their local and regional environments, and aware of national policy developments not just around education but around industry, business and the changing workforce. In addition, they are all engaged in shifting their teaching away from traditional lecture-style passive learning towards an experiential approach characterised by the use of live projects, group working, and close integration with local employers.

The remainder of this report will detail how these strong partnerships with businesses and industry, innovative educational approaches, and future-focused approach support the development of employability provision that responds to the vision set out in the *Industrial Strategy*.

5.6 The purpose of this report

This report will show, through interview data and case studies, how the higher education sector is responding to the *Industrial Strategy* in a number of ways.

As the *Strategy* notes, universities provide expert researchers who generate and transmit knowledge, and collaborate with industry and local businesses to translate that knowledge into innovative practice. Additionally, of course, higher education institutions are creating the researchers of the future through their courses of study.

Higher education institutions are also looking beyond research, however. This report demonstrates that they are committed to nurturing tomorrow's workers in all walks of life by designing learning opportunities and curricula that support the development of transferable, personal and interpersonal, problem-solving, and decision-making abilities. These programmes of study are designed to develop informed, insightful and flexible individuals capable of bringing and applying new knowledge and innovative vision in all occupations.

Our findings show too that the sector was already responding to the drivers behind the *Strategy* prior to its publication in 2017. This report offers evidence that HEIs had already begun to make profound alterations to their curricula in order to create innovative learning opportunities for their students in order to provide integrated employability provision that responds effectively to evolving national needs. These curriculum-level innovations are designed to integrate general academic knowledge and practical, occupation-specific skills in a way that uniquely allows the two to feed into and build on each other

This report also shows how HEIs are working with industry, local businesses and local enterprise partnerships (LEPs) to create these educational opportunities, and that many of the HEIs participating in this study have pre-empted the desire on the part of employers for 'real' work practices incorporated into the curriculum. These collaborations have enabled HEIs to develop and improve the terminology in which they describe their graduates' skills and future employability in ways that align more closely with employer needs and industry practices.

This report contributes new insight into how these HEIs are working to meeting the needs of both students and employers, both at strategic level, through partnerships with industry, and at curriculum level, through the use of innovative teaching and learning approaches. It provides new data on how they are describing the skills and attributes they seek to foster in their learners, and how these skills and attributes align with employer needs. In sum, the report demonstrates how the higher education sector is nurturing the development of its graduates to create a workforce capable of delivering the aims and vision of the *Industrial Strategy*.

6. Findings

6.1 Awareness of the national and regional context

The interviewees in this study were acutely aware of the wider trends, drivers and pressures in the employability landscape. These range from national demographics and region-specific industry trends to the impact of the digital on workplaces and supply chains.

Iain Martin, Vice Chancellor of Anglia Ruskin University, commented that

if you look at the demographics in the East of England, school leavers are not going to be able to meet the workforce skills needs over the next two decades alone, and a whole chunk of it is going to have to come from re-equipping [the] existing workforce – and I'm not sure that the system we have at the moment is quite fit for purpose to do that.

In other regions the issue of the UK's ageing population, recognised in the *Industrial Strategy* as one of the four Grand Challenges, will have a significant impact on employment trends. Andrew Gale, Director of Industrial Strategy, Professional Development & Skills at Cumbria University noted that the county is facing a massive skills shortage, in part owing to its 'super-ageing' population, and argued for a need to focus on upgrading older adults' skills.

Digital technology has made a radical impact across all industries, including sectors as disparate as agriculture and the creative industries. WCG (Warwickshire College Group) offers HE courses in both fields, and its Dean of Higher Education, Steve Taylor, emphasised that students of food production, for example, need to be looking not just at horticulture but at the future of the industry through digital and engineering solutions such as precision technology farming. He also noted that

A lot of what Britain has very much been about for the last few decades has been ... the creative industries, and the creative industries have got a technological dimension. (Steve Taylor, WCG)

In STEM industries such as engineering, the types of skills called for in the workplace are becoming radically different as a result of the digital. As Nottingham Trent University's Pro Vice-Chancellor, Michael Carr, pointed out,

Now the engineering is done by the computer. What we want is people who can interpret the information, make decisions, decide whether there is an optimum process based on the outcome from a computer.

Employers are now seeking much more rounded skills in STEM graduates, including project management and team working abilities. They must also be at ease in an international manufacturing environment with global supply chains. Kate Sugden of Aston University's Engineering School commented on the scale of national and international changes in manufacturing:

Previously you'd go to your local metal shop ... now you've got a global marketplace. This brings its own issues: impact on environment, responsibility for overseas labour forces. It's a different world now.

Finally, digital developments are driving not just technological but social and organisational change at an unprecedented rate across all sectors. Andrew Gale suggested that the real impact of the digital transformation and industry 4.0 is "not actually the technology, it's the organisational change. We change how we work because of technology. ... So basically we need to always be ready to change ... and quickly."

6.2 An evolving need for flexible, lifelong provision

The higher education institutions (HEIs) in this study recognise the need to respond quickly to these radically changing skills requirements in the workforce. Participants acknowledged that offering opportunities for flexible retraining will be a key opportunity for the HE sector:

I think we will see greater demand for stackable qualifications, micro-qualifications, paths in and paths out ... Employers are not interested in having someone study for two years to do a full-credit

qualification – what they want is the ability to have staff develop quickly, move on, pick up the relevant skills. (Iain Martin, Anglia Ruskin University)

What the big companies and big service companies need ... is people with higher skills and with the flexibility to retrain ... I think that's a massive gap in the *Industrial Strategy*. ... I don't think it delivers what 'UKplc' needs. People's skills and work requirements need to change over time. (Lynette Ryals, Cranfield University)

In turn, this requirement for ongoing, life-long development demands a change not only in educational provision but also in how we think about who education is for. Andrew Gale of University of Cumbria observed that "the word 'student' conjures up 'undergraduate'", and that while there is a tendency to focus employability around undergraduates and how quickly they get into work, in fact we should consider the entire workforce, together with those out of work, as learners.

Gale emphasised the need to upgrade older adults' skills, maintaining that provision for lifelong upskilling should continue up to and even past the current retirement age. He noted that a skilled and up-to-date older workforce would bring a number of benefits, including increased wellbeing and fewer inactive people in the workforce, and argued that although the *Industrial Strategy* presents the ageing population as a Grand Challenge – in other words, a problem to be solved – "an ageing society also equals opportunity".

The imperative to change the national discourse around when and for whom education is offered was also voiced by other participants. Lynette Ryals of Cranfield University commented that

[t]he notion that you can front-end load all your education, or training, is completely at variance with the 21st century mode of work where people do change jobs, and they can often change career paths completely. To me that's a fundamental philosophical issue and that's why thinking about the apprentice as a 16- to 19-year-old is misguided.

Study participants felt that this shift towards flexible and ongoing reskilling will mean an increase in the number of pathways through higher education that should be available. Steve Taylor (WCG) commented that the *Strategy* "talks about universities all the way through, but actually it is more than universities: it's where HE is being delivered anywhere". Taylor noted that the Office for Students uses the term 'providers rather than 'universities', which he feels is a more accurate representation of the landscape: "The Industrial Strategy is going to be delivered at HE level – not just through the universities."

Nottingham Trent University, which also offers further education (FE) provision, has experienced a dramatic increase in the transition rate from FE to HE. Michael Carr noted that "colleges and universities are talking about contiguous pathways from level 2 to level 9 ... [and] converting this into a journey path that employers locally can follow".

Fiona Anderson, Economic Partnerships Manager at Nottingham Trent University, pointed out that "the [Industrial Strategy] Green Paper particularly was very strong on pathways", whereas "the White Paper is very R&D-focused ... but pathways is still an important point", and deserving of attention as part of supporting the workforce of the future.

Nottingham Trent University: “Just having the careers talk doesn’t do it”

From this academic year, every student at Nottingham Trent University – undergraduate or postgraduate – will undertake assessed work experience as part of their degree, and will be synoptically assessed in their final year on their performance. Pro Vice-Chancellor Michael Carr explains that “We’ve developed with each of the courses that we run ... a refreshed pedagogy that has fully integrated into it options for work-based learning that the students choose from”.

This focus on work-integrated learning is mirrored in the choice of language that course designers use to relate their curricula to students’ employability. “We try to keep to the sort of language that employers might use so that the terminology is familiar” observes Jane Challinor, Principal Lecturer and subject lead for Health and Social Care. From their first year onwards, students are introduced to the concept that their professional skillset includes competencies, practices and even values:

we look at people’s individual values, and the alignment between their personal values and what Health and Social Care organisations are looking for The Health Service talks about ‘values based recruitment’ so again it’s something we stress right from the start.

This first year module therefore brings together and integrates academic learning and its application to professional practice in a holistic way. The end-point assessment for the module is a research conference organised by the students themselves, who plan and staff the event as well as present research posters. Local employers from the health and social care sector are invited, as well as college students who may be interested in pursuing this pathway.

Students build on this experiential learning in subsequent years, with active learning and group-work featuring strongly in the curriculum alongside the professional practice work placement. “The whole idea of developing their employability skills is threaded through the course,” Jane Challinor explains. This integrated approach produces students who are articulate and independent; comfortable with technology and with working in groups; and able to present themselves as people who can be trusted to get on with things without being supervised all the time.

“Turning them into independent learners is the crucial thing, so our pedagogic style has really changed,” observes Challinor. The shift away from traditional lecture-based curricula to a project-based learning approach across the board is challenging for staff, but the benefits for student learning and employability have been clear. She adds:

“If I’m really honest, just having the careers talk doesn’t do it for most people; really embedding it into the module is the key thing.”

6.3 What do stakeholders want?

“When you’re talking about the Industrial Strategy you’re talking about links to the workplace.”

Steve Taylor, WCG

The participants in this study showed a high level of awareness of the needs of both students and employers as stakeholders in education. There was a clear recognition of the HE sector’s role in preparing individual for employment, and that “Top of what students want now is a better career than if they hadn’t come to university” (Iain Martin, Anglia Ruskin University).

What we're doing all the time here is developing thinking about [...] what do our employer base want from us; how can we continue to tweak the programmes we develop here so that they fit with both student need – i.e. I want a good graduate level job when I finish – and the employer need, which is, 'I want a flow of talent that matches my needs going forward'. (Michael Carr, Nottingham Trent University)

Meeting these needs for all stakeholders means “concentrating on getting exactly the right skills, working in partnership with employers in a range of innovative ways” (Helen Higson, Aston University). Moreover, it requires HEIs to deliver not just traditional subject-based learning, but a comprehensive curriculum that enables the development of a complex range of skills, abilities and personal attributes (see section 6.4).

You have to chunk what we deliver from our graduates into three broad categories. There's the underpinning academic knowledge, and a good grasp of that; there's the relevant professional and technical skills that go with that particular discipline; and there's a third chunk which are the core generic skills that, when you go and talk to employers ... are incredibly important. That's not just for vocational courses; it's for every programme. (Iain Martin, Anglia Ruskin University).

Achieving this multi-faceted educational outcome means looking closely at how those skills are expressed; incorporating their development into the design of learning opportunities at every level; and above all, working in partnership with industry, future employers and regional organisations such as Local Enterprise Partnerships (LEPs), voluntary partnerships between local authorities and businesses.

WCG: Joining the dots between industry and academia

WCG offers further, adult, and higher education routes at seven colleges around Warwickshire and Worcestershire. Among its range of pathways is the engineering degree apprenticeship designed in collaboration with Jaguar Land Rover, on which students study for one day a week over 6 years.

Starting at Warwick Trident College, part of WCG, they pursue a foundation degree written by the institution over two years, followed by four years at the University of Warwick. However, the apprentices remain WCG students throughout. Steve Taylor, WCG's Dean of Higher Education, is proud that this collaboration “shows that link between college HE, university HE and the employer”.

With 200 current students, WCG's is one of the largest degree apprenticeships in the country. The learning design is constantly reviewed and updated in terms of the work the students do at Jaguar Land Rover. By level 6, Steve Taylor explains, the students are starting to move up through the company: learning on the job in tandem with the academic input means that as their graduate-level skills develop they progress through technical roles into more managerial posts with the company. “The two are reinforcing each other: the work and the study.”

The closely interconnected nature of the learning and the career development is not left to chance. As well as a curriculum team which delivers the module content, the institution also has work-based learning officers who maintain the link between employer and students. Regular meetings are held throughout the students' careers to ensure that both the academic and work-based dimensions are advancing satisfactorily.

For Steve, the references in the *Industrial Strategy* to the Midlands Engine and Northern Powerhouse emphasise that the Strategy will be delivered through a joined-up regional approach. “When you're talking about the *Industrial Strategy* you're talking about links to the workplace The work the institution already does with LEPs, bringing together industry and academia, is at the heart of how we decide what sort of provision we need to be putting on”.

The introduction of degree apprenticeships and foundation degrees has allowed HEIs to marry together these key issues of flexible learning opportunities, innovative teaching approaches and collaboration with

future employers and industry sectors. In many cases existing partnerships paved the way for swift and successful introduction of apprenticeship courses; in fact, a number of the institutions who participated in the study had actually pre-empted the introduction of the current apprenticeship levy.

We believed [the degree apprenticeship] was really a summary of what we're all about ... It was magic to us because that's exactly what we do here. (Helen Higson, Aston University)

we have always been very intertwined with our employer base here They are prepared to work with us to develop new forms of teaching and learning (Michael Carr, Nottingham Trent University)

Steve Taylor (WCG) noted with approval the employer's role in leading on the development of an apprenticeship standard, and maintained that "it's quite key that the employer, or the industry, leads on it, not the education institution". WCG's development of an apprenticeship course with Jaguar Land Rover has involved an extensive and ongoing collaboration between college and employer:

There's needed to be a really close working relationship between the employer and the academic side of things The things that happen academically don't necessarily always translate to the workplace, and vice versa. So there's a constant, regular partnership approach to this.

The HEIs in this study were keen to continue building on their strong local partnerships. Fiona Anderson observed that Nottingham Trent University has instituted a range of activities in partnership with local small- to medium-sized enterprises (SMEs):

We've done an enormous amount of work in the last two or three years about finding roles within the SME community for both placement and for wider job recruitment, so there's been a major shift in Nottingham around the SME community taking on graduates.

Nottingham Trent University's subject lead for Health and Social Care, Jane Challinor, added:

when we were designing our new curriculum we sat down with people from the care sector and voluntary sector and said, 'What do you want? If you were going to employ our students, what are the things they need to do to impress you?'

However, Andrew Gale suggested that some companies may be less open to educational partnerships, in part because of a perceived rigidity around how they can be developed. He noted that SMEs in particular may see the apprenticeship levy as a cost rather than an opportunity. He argued for greater flexibility for HEIs to work with these businesses to enhance their educational offer, pointing to the existence of

a huge swathe of SMEs who need certain skills, who want short courses, one module – not a whole degree or a foundation degree, but smaller offers – and if the money's there and the purpose is right, there should be far more flexibility in facilitating the use of that resource for the UK economy. (Andrew Gale, University of Cumbria)

Aston University: 'Education is nothing without experience'

"Work-based learning is in our DNA", Helen Higson maintains, "a red thread throughout everything we do". Aston University was founded by the employers of Birmingham to ensure they could find graduates with the right skills for their companies, and this tradition has been carried on a century later with the advent of degree apprenticeships and foundation degrees. Aston has created a stream of foundation degrees in collaboration with the power industry, as well as the first degree apprenticeship in the UK, in partnership with Cap Gemini.

Aston's approach is underpinned by research that demonstrates the importance of work-based learning, in particular the placement year, to both academic studies and employability (e.g. Jones, Green and Higson, 2017; Andrews and Higson, 2014). As a result, the university embeds a project approach all the way through its programmes. Several Engineering courses make use of the innovative curriculum design technique CDIO: conceiving – designing – implementing – operating, which echoes the stages of an engineering project (<http://www.cdio.org/>). Aston was one of the first UK HE establishments to introduce this technique, which eschews traditional lectures in favour of lab-based learning through projects with industrial partners.

The CDIO curriculum sees first-year Engineering students working in teams to build an electric go-cart or a wind turbine; second-years invent a medical device, then design and build it. Through these projects students learn key aspects of engineering practice, but at the same time they learn how to work in teams, with people from different disciplines, "learning the process of how to approach an open-ended project right from having a blank piece of paper, through design, to testing how effectively it works" (Dr Kate Sugden, Associate Dean for Enterprise). The proportion of applied work that this approach involves is much higher than in some other HEIs, which might offer 200 hours of practical work in the entire three-year undergraduate programme.

There is a clear alignment between the university's strategy and that of its region. Aston sees its links to local businesses as very important, and the education collaboration with them as a means of benefitting companies as well as upskilling students. The university also believes that work-based learning has powerful potential for addressing social inequalities:

We have lots of students from diverse backgrounds, who don't have family members working in the professional engineering sector. Placements are really important so that they understand they *can* go into engineering, as well as what kind of jobs available. (Kate Sugden)

As Helen Higson observes, "Everything we do has got to be aligned with the needs of the three key beneficiaries: students; employers and business; the region and society."

6.4 Defining the landscape of employability: skills, attributes and values

Beyond identifying a shortage of STEM skills, the *Strategy* does not go into detail on the types of skills needed by the workforce of the future. It is notable, however, that the terminology used to describe these skills can vary greatly between and within sectors. The Taylor Review notes that the attempt to articulate and capture skills requirements has resulted in a plethora of frameworks generated by academics, educators and industry (2017, p.86). As Andrews and Higson write, "It is evident therefore, that employability is an extremely complex, and somewhat vague, concept that is both difficult to articulate and define" (2008, p.413).

Evidence from previous studies suggests that the words 'skill', 'attribute', 'competency', 'ability' and even 'value' can be used loosely and sometimes interchangeably by some stakeholders, while others make a clear distinction between them (see e.g. Holmes, 2012; Williams, 2010). As Holmes (2013) warns, we should not assume "that a particular term ... has the same meaning when used within a particular level of discourse by different stakeholders" (p.539).

For instance the distinction between ‘attributes’ and ‘competencies’ is important to Jane Challinor, subject lead for Health and Social Care at Nottingham Trent University:

‘attributes’ covers more than just what you’re good at, or what you know or can do: it’s about behaviours ... it’s much more about who you are as a person and the kind of attitude you might bring. So I do tend to differentiate between attributes, which might be about *how* you do things, and competencies being *what* you do and how well you do them.

Similarly, for Andrew Gale of University of Cumbria, the term ‘competence’ is itself a complex and multi-stranded phenomenon, comprising knowledge, experience and behaviours.

Several interviewees pointed out that students find it difficult to engage with generic ‘employability language’, preferring to express skills in language more specific to the sector or subject:

We try to keep to the sort of language that employers might use so that the terminology is familiar. I tend to use ‘competency’ as the overarching term because we talk about competency-based recruitment (Jane Challinor, Nottingham Trent University)

I talk about them working with projects and in teams, not in ‘employability’ language – I talk about the behaviours and competencies you might see in a job description, rather than about employability ... Students turn off as they think it’s not relevant: it’s not real, it doesn’t change their perception of their skills or their opportunities. (Kate Sugden, Aston University)

Interestingly, Kate Sugden also uses this more concrete, sector-specific language with employers: “I tend to talk to employers about what my students can do, what experiences they’ve got, how business-ready or industry-ready they are”.

6.5 Towards a shared employability discourse: the higher education perspective

Although working towards defining these skills more precisely is likely to be a long-term job, the responses from participants in this study shed valuable light on how the generic language of ‘employability’ might be developed into a more nuanced set of abilities and attributes. In the interviews, participants were asked to identify the skills and attributes needed in graduates either ‘to achieve the vision outlined in the *Industrial Strategy*’ (Pro Vice-Chancellors) or simply ‘in order to be successful’ (course designers). Course designers were also asked how important terminology was to them in describing what their graduates would be able to offer or become.

In the broadest terms, three important characteristics can be identified. It is evident from participants’ responses that these skills go beyond subject, professional and technical expertise - “for us it’s not just the academic content of degrees; it’s the soft skills (Helen Higson, Aston University); that they are cognitively complex – participants spoke of ‘advanced skills’ and ‘meta-competencies’; and that they are of crucial importance.

On looking in more detail at how study participants define these abilities, broad families of ‘soft skills’ emerge which, interestingly, echo many of the key skills identified by the World Economic Forum (2016). These include the ability to apply knowledge in a complex environment; a specific set of skills around using and interpreting data; a rich range of social and interpersonal abilities; flexibility of both cognitive (ability to continue learning) and personal (ability to adapt to change) types; and a cluster of skills around innovative thinking. The final cell contains a set of responses that describe not skills but personal characteristics, behaviours and even values. This again suggests a need to adopt a form of enhanced categorisation that distinguishes more clearly between types of capability sought by employers and fostered by higher education.

These ‘families’ of skills and attributes are detailed in the table below, which combines data from all interviewees.

Apply knowledge in a complex environment	Use and interpret data	Social and interpersonal skills
Problem-solving Problem formulation Arguing from different points of view Asking the right question Systemic understanding	Using data creatively Dealing with incomplete datasets Working with rich data	Acting as facilitator Managing diverse stakeholders Confident communicator Effective listening Able to work in teams Communicating well Optimisation of emotional intelligence Understanding oneself in relation to others and to work
Flexibility	Innovative thinking	Attributes, behaviours and values
Ability to work both in a team and remotely Ability to work both in a team and independently Develop and respond to change Be flexible and adaptable Adapt to new environments Good learning and research skills	Problem formulation Understanding the big picture Seeing the big picture but also dealing with detail Be entrepreneurial and enterprising	Creative Professional Resilient Capability to reflect Take responsibility for decisions Feel comfortable with dealing with complexity Consider learning as a lifelong journey Resilience in its many forms Self-awareness

In addition to these clusters of individual skills and attributes, some participants added interesting comments on how these capabilities might manifest or develop in the workplace.

Sal Jarvis (University of Hertfordshire) suggested that being ‘enterprising’ means “looking for opportunities in the companies they work for, not just at the start of their employment career” and that “the world will keep changing and to be effective the people educated by us need to develop and respond to change”.

Andrew Gale of University of Cumbria identified some nuanced interpersonal abilities, among them

understanding about the role of the individual in a group or team; in an organisation; in an economy
a clearer understanding of international cultures, how to make things work internationally.

Lynette Ryals (Cranfield University) distinguished a number of abilities related to the rise in remote working, ranging from technical/digital skills through to personal attributes:

... connective working in teams and virtual teams is going to be a really important thing. Time management, actually, is going to be a really important skill.

Interestingly there will be something around resilience, emotional resilience. Working remotely has a different kind of dynamic constantly connected also means being constantly stressed.

Finally, leadership emerged as a strong theme:

[we foster these skills] because we’re trying to create not the next generation of technicians but the next generation of senior leaders. (Helen Higson, Aston)

command and control leadership is now last century, and we’re going to need to develop those new kinds of skills and attributes (Lynette Ryals, Cranfield)

the ability to work with others ... as a leader and as a member of a team, [and] the ability to behave fluidly in both roles. (Sal Jarvis, Hertfordshire)

The multi-faceted nature of these contributions again emphasises the complex and interconnected character of skills, knowledge, personal attributes and values, and the need for a shared means of indicating both their nature and their development.

Study participants' experiences show the value of genuine dialogue and collaboration with employers and local industry to establish a shared perspective.

[Our industrial partner] Grant Thornton ... helped us with the kind of language we were using, because we were describing modules in ... 'HE language' We changed a lot of the language that we're using as a result of talking to them about what people use in practice. So that's been a very good partnership. (Lynette Ryals, Cranfield)

... you'd hear [employers] regularly say 'Well, we're not getting the people coming out of university that have got the skills that we need'; now this is the chance to say 'Well actually, if you work together on this you can create the type of education that will give you the skills you need. (Steve Taylor, WCG)

Through sustained partnership with local and national industry groups, LEPS, employers, and government, there is the potential for a clearer shared language around employability to emerge.

6.6 Active learning pedagogies: learning by doing

"Everything we do is about application."

Toby Thompson, Cranfield University

To develop this broad and sophisticated range of skills and attributes in their learners, all the institutions participating in this study were employing one or more forms of active learning in their curriculum design.

Active learning is characterised by students' engagement in their own learning, and by a focus on constructing knowledge through 'doing' rather than receiving knowledge through passive absorption, e.g. listening to a lecture. As a result, it is "analytical, immersive and requires learners to be participant both cognitively and affectively. It develops not only skills and knowledge but attitudes, values and behaviours" (Hanney, 2018, p.771); or as one interviewee described it, this kind of learning engenders "a strong sense of their transferable skills" in students because they are "not just on the train line of just doing their subject" (Steve Taylor, WCG).

Active learning often involves sustained group work, or Team-Based Learning (Sibley and Ostafichuk, 2014), requiring students to work together intensively over time; open-ended problem-solving tasks, known as Problem-Based Learning; and project-based work. These projects are frequently industry-focused, and may even make use of partnerships with local businesses to work on real case studies or challenges faced by the companies:

[employers] are very interested in project-based activity, so we've developed courses where from day one the students are working on projects that have been provided by external partners (Michael Carr, Nottingham Trent University).

We specifically have a lot of focus on team working ... Typically we will engage if we can with just one company (sometimes it's more than one) to give us a really substantive project, to set a project that the students then work on in teams. (Lynette Ryals, Cranfield University)

With their focus on teamwork, applied knowledge, problem-solving, and 'real-world' issues with no clear or single answer, these forms of learning call for a radical change in curriculum design away from lecture-led knowledge transmission and pre-set learning outcomes. Helen Higson (Aston University) explains that

It's about making sure that the skills come first and then the empirical knowledge is attached to that. We find that that makes our students more attuned to what's needed in the workplace; [and] they find it easier to pick up knowledge.

University of Hertfordshire: Accelerating aspiration

Achieving the vision outlined in the *Industrial Strategy* will require comprehensive and high-level skills development, Dr Sal Jarvis suggests. For example, while the *Strategy* mentions developing a technical route for individuals not going to university, this 'streamed' approach misunderstands the range of skills and attributes that will be needed across the workforce of the future.

University of Hertfordshire designs curricula that foster technical expertise in tandem with transferable, employment-focused skills development. In doing so it seeks to transform its students' aspirations and change their perception of how they can contribute to society. "A big part of what we are working on is in the area of aspirations," emphasises Thomas Baker, Associate Dean in the School of Engineering and Technology. The university has a widely diverse student population, many of whom are the first in their family to come to university.

"Some students really don't get what world is going to be available to them once they've come through and achieved their degree," Baker notes. "Part of our job is to open their eyes to the opportunities that will be open to them once they graduate".

The university formalised the CDIO approach as one of its pedagogical priorities into its Engineering curricula in 2017. Aston University adopted this approach some years before (see case study), and have been happy to share their experiences and practices with the University of Hertfordshire.

CDIO is the obvious pedagogic method for Engineering, Thomas Baker maintains. It enables 'learning in action', with students developing applied technical expertise together with interactive team working, problem solving skills, and creativity. An example is the production line activity in which students work in groups to assemble a skateboard: the activity takes the students beyond the technical skills of assembly into the intricacies of designing an efficient production line, dealing with log-jams, and achieving the highest quality output in the minimum time.

A testament to the success of this pedagogic approach is feedback from a student who went on work placement and announced that "it felt like coming home".

The collaborative design of apprenticeship standards and foundation degrees means that employers have significant input into the content and assessment of these courses. However, active and applied learning, and in particular work-based learning, offer still further opportunities for mutually beneficial partnership between HEIs and industry. For example, 80% of students at Aston University currently undertake a one-year placement, and this will be mandatory for all courses by 2020. "That's not just a job; it's an integrative period of work which ... counts for 10% towards the degree" (Helen Higson).

Among other opportunities described by interviewees were the use of 'live' projects and case studies, as outlined above; mock assessment centres run in collaboration with employers; and direct input from industry to modules and courses in the form of guest lectures, visiting staff and advisory groups.

Cranfield works very closely with companies already so the idea of having project work, an advisory board, and working together to frame relevant education and relevant projects and relevant application worked really well for us. (Lynette Ryals)

We use a cadre of visiting staff in departments to enrich the learning content for students. This is terribly important ... Also, we make people honorary fellows specifically, deliberately, so that they will come back and give back to the curriculum. (Andrew Gale, University of Cumbria)

... we do an enormous amount of employer dialogue, ranging from advisory boards to the individual schools and sometimes courses, all the way through to embedding the work of those organisations within our university they provide us with members of staff who teach or help to support the teaching; they provide us with project work which our students undertake as part of their degree; they provide us with case study material for the students to go out and visit and work on; ultimately they give placement work to our students; and we hope at the end of it they might employ a few of them as well. (Michael Carr, Nottingham Trent University)

As Sal Jarvis (University of Hertfordshire) comments, these forms of learning are “about combining employment in a really live way with rigorous academic education that enables people to reflect on what they’re doing in the workplace”.

SAE Institute: Hitting the right notes for employability

The music and media industries are undergoing profound change at a previously unforeseen rate of acceleration as consumers engage in technologies, social media and new devices and platforms. Lee Erinmez points out that to be a successful musician now requires so much more than making music: it demands an understanding of project, time and people management, alongside skills as disparate as web design, using spreadsheets, and understanding copyright law.

Students can struggle to grasp the relevance of these wider forms of knowledge, and – because of this – often don’t realise how much they themselves have to offer as individuals. “They come in wanting to make beats or be a rapper, but we help them identify a wider skillset,” Lee maintains. The courses run by SAE Institute, a private HE provider offering two-year degrees, help students maximise their employability in the creative arts by making these diverse abilities both tangible and accessible by embedding them seamlessly with the curriculum.

Project-based learning (PBL) enables Lee to create courses that steer away from marking criteria and learning outcomes and instead immerse students in a practical, applied context by designing, planning and executing their own projects. PBL enables a highly flexible delivery of content and lends itself to common modules - collaboration across subject programmes, meaning that students hone their team work and interpersonal skills as they learn from and about what other students are doing. “It’s almost like mashing sprouts into your kids’ Christmas dinner ... all of that stuff is in there and they don’t realise that they’re eating their greens”.

This teaching is enhanced by input from industry specialists whose stories and experiences show students the crucial importance of the transferable, soft skills that enable the application of their subject expertise. “That’s why a huge part of my job is to engage with industry – send the students out, bring the industry in ... That’s the context for me that underpins all the academic stuff”, Lee asserts. The enrichment of the academic learning with these wider transferable skills is so successful that students do not notice any separation.

6.7 The role of reflection in active learning

The transformative power of project-based learning, collaborative group working, and other active learning strategies is brought about by “a process of *reflection* on the actions and interactions that come about through experience, leading towards a refinement of judgements of choice and future action” (Hanney, 2018, pp.770-1, our emphasis).

The role of reflection is fundamental to the development and deployment of the ‘higher-level’, ‘transferable’ or ‘soft’ skills outlined by participants in section 6.7, such as arguing from different points of view; managing an open-ended project; dealing with complexity; and being flexible and open to change. These abilities are developed not through experience alone, but experience married with the capacity to evaluate and learn from it in order to develop informed judgement.

The HEIs in this report have ensured that opportunities for reflection and self-evaluation are explicitly built in to their curricula. Cranfield University's SEMAP (systems engineering master's apprenticeship programme) course is designed and timetabled in a way that allows for reflection in practice, amalgamating academic provision and portfolio work.

University of Cumbria: "A ladder of opportunity"

The University of Cumbria is the youngest institution in this study, created in 2007 to be the HE Anchor Institution for its region. Key to its role as anchor is educating people to support the labour requirements of innovative local employers; developing the workforce by attracting talent and upskilling the local population; and ensuring that academic practice is relevant to the place in which practitioners live and work. As such, from its inception it has been deeply embedded in its region and aware of local economic and industrial needs.

As noted in the main report, Cumbria has a significant and increasing skills shortage regionally, a higher than national average older adult population, and skills levels that are below the national average. In light of this regional picture, Andrew Gale, the University of Cumbria's Director of Industrial Strategy, Professional Development and Skills, insists that the HE sector should be proactive in developing its employability provision for students:

regardless of the *Industrial Strategy* we should be considering employability ... So it's not because of the *Industrial Strategy* that we're considering the employability agenda for students.

Like many other institutions in this study, University of Cumbria is committed to integrating practical work experience into academic learning, enhancing what Gale calls the "industrial skills" of problem formulation, systemic understanding, the ability to analyse rich data and to grasp the big picture. The university develops these complex skills through meaningful placements that coalesce students' academic understanding and practical, applied learning with a significant reflective component. Andrew Gale maintains that "If we understand competence as being made up of knowledge, experience and behaviours, the experiential part is very important: that's where placement comes in and enhances the learning."

The University has designed a proactive and highly flexible approach to providing learning and reskilling opportunities at multiple levels. It leads on Project Academy for Sellafield, an 8-year project with a framework agreement to deliver higher education from Level 4 through to Level 8. Notably, the training and education developed for the Academy is available to all individuals and is being used by other companies in the region in addition to Sellafield, and includes short courses, professional qualifications, and CPD opportunities.

Andrew Gale sees this initiative as an innovation in the way learning is configured:

We can partner with anyone; people can come in at any level, go off at any level, and it doesn't have to be award-bearing, it can be CPD. So it's this notion of a ladder of opportunity for people to climb up, to optimise themselves ... the curriculum, the delivery, and the collaboration and partnering all come together.

Its Professor of Systems Engineering Education, Emma Sparks, sees reflection in practice as "a crucial part of what we do" to create the engineers of the future.

Lee Erinmez of SAE Institute affirmed that

Project-based learning can really apply itself ... to a lot of the reflecting in practice that we do in education you can be afforded the luxury of having time to digest and reflect and then see how you might do something next time.

He describes how the traditional roles of teacher and student change profoundly when active learning strategies are used. The “learning environment becomes a working environment: it’s not a classroom”; as a result, “I don’t see myself as a teacher when I’m doing this, it’s more like a facilitator or consultant” (Lee Erinmez, SAE Institute).

Steve Taylor of WCG concurs:

you didn’t start the module and say ‘Here’s a list of all your lectures’; what you said was actually ‘You know what, let’s get some activities going which will enable you to think creatively, and then you start defining and shaping the project yourself’. In doing that, the transferable skills come to the forefront.

For Cumbria’s Andrew Gale, this dovetailing of academic, experiential and reflective learning offered by HEIs constitutes a unique educational offering that cannot be replaced by other forms of learning, including on-the-job training.

... to be able to apply knowledge effectively, or apply research or findings, I think an understanding of the bigger picture and having a challenging educated gaze is fundamental. I get very irritated when the words education and training are used synonymously. I think this is actually a misunderstanding of the role of education *and* training – and we do both within the curriculum.

6.8 Impact of active learning on teaching methods and practices

The shift from the traditional transmissive, lecture-led approach has sweeping implications for HEIs and their teaching staff, not only in terms of the curriculum and learning objectives but also the design of learning spaces, support for new technologies, and even timetabling.

Thomas Baker, commenting on the profound impact of implementing the CDIO approach as a pedagogic method at University of Hertfordshire, explained that “With this approach you can’t just tweak your modules; you have to rewrite your whole approach”. Similarly, Michael Carr of Nottingham Trent University noted that

These are quite innovative ways of thinking and working – the pedagogy’s got to be quite cleverly constructed as part of that; and then fundamentally [...] we’ve got to deliver it to the satisfaction of the partner.

Many of the study participants found the new teaching approaches exciting and rewarding:

It’s been a bit like painting the Forth Bridge with different university initiatives requiring us to refresh the curriculum in different ways over the past few years. But that’s been great because it’s given us the opportunity to be really sensitive to what employers are looking for, what the graduate attributes are, and what kind of graduates we want to build. (Jane Challinor, Nottingham Trent University)

One of the thrilling things about engineering is that it is physical It’s very exciting and students can see what they’ve done, and again the whole CDIO approach is very useful. (Thomas Baker, University of Hertfordshire)

Several interviewees acknowledged that changing from a traditional lecture-based syllabus to an active learning approach can be challenging for teaching staff:

making sure that we’re aligned with the *Industrial Strategy* and that what we do is always relevant [is] quite radical for some staff – they can’t do just what they want to do but because it develops the skills that employers need for the region. (Helen Higson, Aston University)

as an academic lecturer you needed to approach things slightly differently, they needed to think of themselves as a facilitator (Steve Taylor, WCG)

However, as Iain Martin (Anglia Ruskin University) points out, this is an adaptation that the HE sector must make. “If we’re not producing flexible graduates who recognise the importance of adapting quickly to new environments, working in teams, then we’re failing.”

Anglia Ruskin University: Building the environment of the Fourth Industrial Revolution

With its links to construction, planning, energy and infrastructure, Architecture is a discipline whose graduates will make a significant contribution to the vision outlined in the *Industrial Strategy*.

Dr Alison Pooley, course leader of the undergraduate Architecture course at Anglia Ruskin University, has mapped the graduate attributes and learning outcomes of the course closely to the criteria set out by the Architects’ Registration Board. She emphasised the practical nature of the graduate attributes identified by the professional body, noting that that out of six attributes four start with the word ‘ability’: “When we write our learning outcomes we have to use the right words, so that not everything is focused on [academic] knowledge and understanding”.

As Vice Chancellor Iain Martin emphasises, the choice of pedagogic technique is crucial: “developing skills here is about looking at how you teach... so that you’re bringing students into an environment where it’s not [about] being passive recipients but engaging with knowledge, building the sense of teamwork.”

The substantial applied element of the undergraduate Architecture programme see learners working in a studio environment for more than half of their course, focusing on practical design activities that complement academic assessments such as essays and reports. The design modules feature tutors from professional practice, and students work on live projects with industry clients and community groups. Alison Pooley notes that this creates “a sense of realism that you’re actually responding to a brief, an agenda coming from a client. It gives students a flavour of the real world and builds an understanding of economic constraints”.

As a multi-stage career route that requires at least two years in practice as well as three stages of qualification, Architecture develops a close relationship between theory and application and creates committed professionals whose contribution will have a profound impact on the environment of the Fourth Industrial Revolution. As Alison Pooley observes, “My 18-year-olds have a long journey to get to influence. They’ve got to look at the bigger picture and the long view And shine a light into the future.”

6.9 Impact of active learning on society

The experiential, participatory and reflective nature of active, work-based learning is not just transformative for students and staff members: the participants in our study also suggest that it has the potential to be transformative for society. By producing more rounded graduates who combine subject knowledge with high-level professional, interpersonal and cognitive skills, active learning meets the needs outlined in the *Industrial Strategy* for the workforce of the future.

Moreover, participants in the study indicated that the experiential, work-integrated dimension of this type of learning has the potential to benefit society more widely by acting as a mechanism for addressing inequality. As Michael Carr explains, Nottingham Trent University’s commitment to integrated work experience for every student directly supports the university’s key strategic interest in social mobility:

our game really is driven by the fact that we know students ... from a widening participation background struggle to keep up with those coming from more socio-economically advantaged backgrounds. How do we actually bridge the gap? It predominantly comes from work experience.

Helen Higson (Aston University) also emphasised the crucial importance of work experience for learners with less social capital - “students who come from families who haven’t been to university, students who haven’t had the chance of high-level work experience because of who their parents know”.

At Cranfield University, the Executive MBA Apprenticeship is attracting students who are both older than the average university attendance, and from a range of backgrounds: “in that intake one in seven are coming to us without a first degree, without that traditional educational background” (Lynette Ryals, Cranfield University).

Lynette Ryals also commented on the excellent calibre of these more experienced students compared with the performance of more traditionally composed, on-campus cohorts, a point that was echoed by others. Helen Higson observed that Aston’s degree apprenticeship graduates’ performance is “higher, stronger, than the traditional on-campus students” and that “they also come from a much more diverse background, so, for example, more women in engineering”. Michael Carr has found that, of the two forms of business management degree offered at Nottingham Trent University— a traditional campus-based route and a parallel course with a sandwich year placement - significantly higher numbers who undertake the industry-based route get firsts.

Cranfield University: “Not just a knowledge upgrade”

Cranfield was the first university in the UK to offer level 7 apprenticeships, an innovation that was launched before the current apprenticeship levy scheme. The Systems Engineering Master’s Apprenticeship Programme, introduced in 2016, uses Team-Based Learning and real-world case studies to simulate what it means to be a systems engineer in the workplace. The programme also makes use of peer-to-peer feedback – students evaluating and assessing their fellow learners’ work – to build confidence and communication skills, together with multiple opportunities to present on and debate the work the teams have designed and implemented.

Dr Toby Thompson, Networked Learning Director, explained that Cranfield’s lecturers explicitly design curricula that develop not only technical specialism in their graduates but also meta-competencies such as smarter working. Prof Emma Sparks, Professor of Systems Engineering Education, identified further meta-competencies developed on the SEMAP course including managing diverse stakeholders; effective listening; and the ability to both see the big picture and deal with detail.

Cranfield’s programmes contain a strong emphasis on live projects from industry, building in case studies from commissioning clients. In addition there is a particular emphasis on working, innovating and communicating remotely. The postgraduate diploma in Engineering Competence consists of consists of 32 days of live, online lectures – delivered in 8 blocks of 4 consecutive day-long webinars – after which the groups of students work together remotely for a further six weeks on a live case study from industry. The programme’s digital delivery method is not merely an adaptation to new educational technologies, but a deliberate choice built in to the teaching design: it compels learners to become comfortable with collaborative networking technology and working in a fully remote capacity. Toby Thompson comments that “you can’t get away from the fact that this is how you work and learn together Being all together in a classroom would stymie, limit, hobble this approach”.

Similarly, Emma Sparks notes that the SEMAP curriculum is specifically designed to foster the sharing and creation of knowledge across geographically dispersed teams, even down to managing document control in virtual collaborations. The learning experience mimics what they will increasingly experience in the workplace as employment becomes more location independent, promoting autonomy and decision-making.

Underlying this teaching approach is a commitment to a vision of genuinely lifelong learning. Cranfield thinks in terms of andragogy – adult-specific learning – as distinct from pedagogy: “it’s much more about the self-directed learning and peer-to-peer learning and practical application of knowledge” (Lynette Ryals). The result is a transformative learning experience that enables students to expand both their technical abilities and meta-competencies into the workplace: “It’s a ‘doing’ work; not just a knowledge upgrade – they are confident to *do something*” (Toby Thompson).

As well as addressing issues of widening participation and social mobility, live projects and work-based learning enable an exchange of knowledge between student and industry, meaning that employers as well as learners can learn, reflect, and reskill. Fiona Anderson of Nottingham Trent University observed:

We're also looking at placements as a form of knowledge exchange, thinking from an *Industrial Strategy* point of view, from the student in terms of new learning ... into companies, particularly small- to medium-sized enterprises. Given that we're ostensibly in a low-skills, low-value economy, it's helping to stimulate the demand for higher-level jobs – and clearly that's got a greater flow into the *Industrial Strategy*.

Similarly, Lynette Ryals describes the mutual benefit of using company-led live projects in Cranfield University's curricula:

This works so well that the companies send us projects year-in, year-out. Why that's nice is because it isn't just about the skills the students get, and the opportunities to possibly get employment and to work on real projects, but it's also that the companies themselves learn We think those are very interesting and innovative dynamics.

6.10 Active learning and creativity

Active learning strategies, with their powerful combination of experience and reflection, foster curiosity and an innovative mind-set. The curricula employ a 'learning through doing' approach using real-world problems and challenges where there is no pre-existing right answer, as opposed to artificial scenarios created purely for the purposes of assessment.

In doing so, they create an environment in which students are prompted to go beyond the boundaries of discipline knowledge in search of solutions, and draw on expertise from a wide range of perspectives.

We've started to look at getting some of the business school students to work with the aerospace engineering students, but we've also looked at getting that link between technology and management: so that as well as being asked to develop a new undercarriage or a new aircraft design ... students are also having to think about the commercialisation of those ideas. (Lynette Ryals, Cranfield University)

At University of Hertfordshire the School of Creative Arts has designed a cross-curricular programme for students to learn about one another's fields and work together. Sal Jarvis described how this enables students to network, make connections and try out aspects of related disciplines to enable them to deliver on their own project.

That for us is about understanding the fluidity and flexibility of being in the workplace ... you have to draw on a whole range of other disciplines in order to be able to do something. (Sal Jarvis, University of Hertfordshire)

This multi-disciplinary dimension of active, applied learning underlines how 'soft' or 'transferable' skills and meta-competencies, despite being taught and applied within the subject context, actually overflow beyond the boundaries of discipline-specific knowledge and expertise. As Iain Martin (Anglia Ruskin University) pointed out,

There's the underpinning academic knowledge; ... the relevant professional and technical skills that go with that particular discipline; and there's a third chunk which are the core generic skills that, when you go and talk to employers ... are incredibly important.

Higher education teaching and learning can therefore offer a uniquely valuable learning experience. It not only supports the development of subject and professional knowledge to a high level, but also, through active learning strategies, innovative curriculum design and multi-disciplinary collaboration, creates graduates who can see beyond the parameters of their degree subject - workers who can think critically, problem-solve creatively, communicate effectively, and above all respond flexibly and innovatively in the unpredictable and rapidly changing circumstances described in the *Industrial Strategy*.

There's a danger sometimes that an Industrial Strategy focuses on the hard skills of science and technology and engineering but it forgets some of the softer skills that are associated with creative thinking and interpretive thinking and communication. (Steve Taylor, WCG)

...technology, STEM skills are important but they're not the only ones that are important for our society going forwards. (Michael Carr, Nottingham Trent University)

The benefits of this open, collaborative and multi-disciplinary approach for future innovation are clear. The *Industrial Strategy* sees the Fourth Industrial Revolution already underway as “characterised by a fusion of technologies that is blurring the lines between the physical, digital and biological worlds” (2017, p.32). Realising this vision will require flexible and cognitively agile workers whose subject expertise and technical competencies are augmented by the crucial ‘soft skills’ of creativity, complex problem-solving and critical thinking (WEF, 2016), enabling novel and resourceful applications of knowledge to new contexts.

7. Conclusions and recommendations

7.1 Discussion: the higher education sector's response to the *Industrial Strategy*

This research set out to explore the following questions:

1. In what ways is the *Industrial Strategy* influencing and informing questions of programme design and delivery in HE?
2. In what ways are HE providers taking into account the *Industrial Strategy* through their curricula and approaches to learning and teaching?
3. How is employability development within an HE setting responding to the broader context of the *Industrial Strategy*?
4. What evidence is there to suggest that employability development within HE is cogent and aligned with the national needs outlined in the *Industrial Strategy*?

Our findings demonstrate that parts of the HE sector are keenly aware of the goals and opportunities set out in the *Industrial Strategy*. It also shows the breadth of HEIs' partnerships with LEPs and local employers, many of which predate the publication of the *Strategy*, and their acute awareness of the broad national and regional trends affecting employment and industry.

It is evident that the institutions and providers highlighted in this study are responding to these trends in both their practices and their strategic positioning. The introduction of active learning strategies, and the strategic thinking behind their introduction, have influenced not just the curriculum and the student experience but more fundamentally how HEIs frame themselves and articulate their purpose and their role in society.

The senior leaders interviewed demonstrated comprehensively that they are actively responding to the major themes of the *Industrial Strategy* at strategic level, through partnership cultivation, apprenticeship standards and close collaboration with industry and business stakeholders. At the curricular level, this study found not only that HEIs are engaging actively with government-created pathways such as foundation degrees and apprenticeships. They are also incorporating meaningful work placements and sandwich years into their curricula, together with in-course opportunities for students and local businesses to work together on solving 'real world' problems.

This report also demonstrates that universities are creating innovative learning environments where theoretical and practical knowledge are developed through experiential learning with a high degree of reflection, enabling the crucial development of what are often called 'soft skills' – social, interpersonal, problem-solving, creative and critical thinking abilities.

When asked whether their pedagogic provision had changed in response to the publication of *Industrial Strategy*, study participants suggested that their teaching was continuing to develop in alignment with the *Strategy* rather than changing direction because of it. In Helen Higson's words, "The answer is yes and no – because we've been doing it for ever".

Similarly, Sal Jarvis highlighted that University of Hertfordshire's approach is "accelerating rather than changing"

The *Strategy* has provided impetus for us to expand those kind of approaches and that kind of work [but] this is what we do: professional, technical and business-facing education is what we do as a university, that's our mission. (Sal Jarvis, University of Hertfordshire)

Other participants suggested that the *Strategy* itself can be seen as a response to the same drivers that prompted HEIs to develop innovative teaching and employability strategies in the first place:

In some ways the *Industrial Strategy* is actually a national response to what's going on. So I think if there wasn't an *Industrial Strategy* a lot of this would still be happening, but I think it has drawn

attention [to] developing the right skilled workforce for the future, for a real understanding of the need for flexibility and adaptability going ahead. (Iain Martin, Anglia Ruskin University)

... it's almost like the *Industrial Strategy* and the Office for Students are responding to work that started to go on in College-HE. (Steve Taylor, WCG)

However, participants were hesitant to suggest that the sector as a whole is responding at a uniform rate. Several suggested that employer collaboration is 'patchy': "Some universities are fantastic at it but others less so as they don't have the industry links"; "the average professor wouldn't know what a LEP was; that's pretty worrying in view of their importance in the White Paper".

One interviewee pointed out that "research-intensive universities may be good at developing [research] partnerships with industry but less so in terms of teaching and learning". Perhaps as a result, the sector is seeing a split between HEIs (generally universities) who employ traditional, lecture-focused pedagogies and those who seek to foster the complex, rounded set of transferable skills and attributes outlined in section 6.4. This point is reinforced by a comment from one participant, who referenced feedback from engineering and science employers who claimed: 'We go to the Russell Group for our technology and we are increasingly coming to the non-Russell Group for our skills'.

It should be borne in mind that HE curricula cannot simply be changed mid-course, as this may mean a breach of its contract with students (CMA, 2017; Hammonds, 2017). Therefore it will be 2018-19, after publication of this report, before specific curricular changes in response to the *Industrial Strategy* can be documented. However, this report shows how closely HE providers have been watching the national conversation on employability and how they have pre-empted much of what the Strategy suggests they should do – and possibly helped to shape it.

The responses and case studies reported here offer a snapshot of outstanding practice in teaching and learning by a number of HEIs. Key to this is the movement away from traditional lecture-based approach, a move that cannot be effected by tweaking existing curricula or bolting on a standalone project module or generic employability module. Rather, it requires a profound change in teaching design and pedagogic philosophy, grounded in a new vision of the university's or HE provider's role and purpose in wider society.

With a clear alignment of values towards social mobility, workforce readiness and creating reskilling opportunities through thriving educational partnerships with industry, HEIs are no longer leaving it to the graduate to discover how s/he might apply the knowledge gained at third level: rather, they are explicitly creating opportunities for students all the way through their programme to explore the real-world applications and implications of their learning.

7.2 Higher education teaching has a unique role in transferable skills development

We have seen in the findings and case studies how the use of active learning strategies – notably project-based learning, collaborative or team-based learning, and flexible forms of work-based and work-integrated learning – enables students to develop as rounded, agile future employees. As graduates, they are capable of applying specialist subject knowledge in creative and problem-solving ways, as a result of a high-level integration of academic understanding with applied and transferable skills expertise.

The authors of the Taylor Review "heard time and time again about the importance of transferable skills, such as communication, team-working and organisation, alongside job-specific technical qualifications and training" (2017, p.83). The findings of this report indicate that higher education providers are not only alert to the importance of these skills but are actively supporting their development through innovative use of active learning approaches that foster experiential and reflective development, such as project-based learning (PBL).

Hanney (2018) asserts that project-based learning

occurs through a process of reflection on the actions and interactions that come about through experience, leading towards a refinement of judgements of choice and future action. (pp.770-1)

The role of reflection – a stepping back from practice to look critically and constructively at how it worked (Moon, 2013) – is crucial both to learning and to innovation. Rather than merely repeating what has happened before, reflection enables insights on which new directions can be explored. As interviewee Lee Erinmez (SAE Institute) put it, it offers “time to digest and reflect and then see how you might do something next time”.

Notably, these reflective opportunities do not necessarily occur naturally in practical work environments:

work experience per se may not be sufficient for being better prepared for the transition to work. It might be that reflective/metacognitive activities, which enhance an individual’s learning and self-evaluation through work experience ... could be more helpful for career development (Garcia-Aracil et al., 2018, p.9)

Björck and Johansson note that there is an entrenched dichotomy in much employability discussion, such that “theory means campus-based training and practice means work placements” (2018, p.1). They suggest that this may be created by a divergence between the ‘theoretical’ university space and the applied workplace, creating mutually isolated settings in which only one form of learning can be accommodated. Arguing that “theory and practice are equally valid components of higher education which enrich each other” (p.2), they postulate an ideal “third place” in which fully work-integrated learning can occur, integrating theoretical and applied understandings.

What the case studies and findings in this report suggest, however, is that some HEIs have already found a way to fuse these two domains by means of active learning approaches. Due to the experiential and reflective nature of these curricula, students are empowered to ‘step back’ from both theoretical and practical learning to explore and understand how they inform and enrich each other.

The excellent practice showcased here fulfils Björck and Johansson’s desire for a work-integrated space that “gives students the opportunity to learn and practise theories (ideas, principles etc.) at the same location [and] which embodies the idea that theory is learnt in and through practice” (2018, p.11).

Recommendation:

Conduct more extensive research to establish:

- + a fuller review of existing literature in the field
- + what proportion of the HE sector is employing innovative teaching methods for integrating academic and applied learning
- + further evidence of how these methods connect with and actively foster the skills and attributes that employers will seek in a rapidly changing employability landscape.

7.3 The skills required by the Industrial Strategy extend beyond STEM subjects

As outlined in section 6.9, several of the participants in this study stressed the need to look beyond STEM disciplines to create a workforce that can deliver the aims of the *Industrial Strategy*. This view is supported by the 2018 Universities UK report which asserts that “Increasing demand for higher level skills will be across a range of subjects, with humanities being as important as science and engineering ...” (p.4).

The *Industrial Strategy*’s primary concern in regard to identifying specific skills and training requirements is with the need for increased technical and digital expertise across the whole population. Laying too much emphasis here, however, neglects the crucial importance of the advanced transferable skills and meta-competencies that are fostered in graduates from every discipline area and will be vital to the successful delivery of the *Strategy*’s vision.

The data presented in the World Economic Forum’s *Future of Jobs* demonstrate that

the potential net job creation in absolute terms in the STEM field alone will not be sufficient to absorb strains on other parts of the labour market There is a need for potentially reskilling and upskilling talent from varied academic backgrounds in all industries. (2016, p.25)

In a post for the LSE Centre for Economic Performance, Valero and Davies (2017) concur:

Sector support should not be restricted to high-performance/high-growth sectors like aerospace and pharmaceuticals. Low productivity sectors such as retail, hotels and administrative services employ a large share of the population, and suffer significant obstacles to growth (such as the availability of skills or investment in technology) that the government can help to address.

Broadening the understanding of the range of skills and attributes needed to deliver the *Industrial Strategy* beyond STEM qualifications may also help to avert the threat of increased regional disparity outlined by Fothergill, Gore and Wells (2017). They argue that the funding allocated by the UK government to support research and development is targeted at an “exceptionally narrow” range of sectors which accounts for “little more than 1 per cent of the whole economy (by employment) and 10 per cent of UK manufacturing” (p.2).

This disparity is increased by the uneven regional distribution of jobs in these sectors:

The distribution across the country of research and development establishments – along with universities and R&D labs in large companies likely to be first in line for the new R&D funding – is particularly skewed in favour of an arc to the immediate north, west and south of London. (2017, p.2)

The same effect can be seen in the health research sector, argue Wilsdon and Jones (2018), who point out that “55% of publicly funded health related research is carried out in just three cities – Oxford, Cambridge and London”. As a result,

[t]he parts of the country with some of the biggest health problems, and the most intractable economic problems are remote from our centres of health related research, and their priorities are unrepresented. This is bad for the economy, bad for our healthcare system, and dangerous politically.

The authors argue that “there needs to be a much greater diversity of people, disciplines and perspectives involved in setting research and innovation priorities” (Wilsdon and Jones, 2018).

Recommendations:

- + Develop a broader collective vision that looks beyond STEM subjects to recognise the creative and innovative possibilities fostered in graduates of all disciplines
- + Explore how to capitalise on the transferable skills and meta-competencies of graduates in all disciplines to implement the vision of the *Industrial Strategy*

7.4 Technical and academic knowledge are closely interconnected

Greater emphasis on the skills and meta-competencies developed by graduates from all disciplines, together with a recognition of their importance for the development of all sectors, would align with Universities UK’s recommendation that “a ‘whole-skills’ approach needs to be adopted” on the basis that “the difference between academic and vocational qualifications, which is already blurred, will become less relevant” (2018, p.4).

This point has implications for the structure of educational provision: how students access it, the routes they pursue through it, and the point at which they choose to specialise. In a post for WonkHE, Latham notes that the introduction of T-Levels alongside A-Levels, as set out in the Post-16 Skills Plan (REF), will result in parallel, differentiated education routes. He questions

whether the government has framed things quite right when it conceptualises putting “technical education on the same footing as our academic system”, as if the two are entirely distinct. (2017)

Latham’s argument that “Technical or vocational skills are important at all levels of the system from compulsory age upwards” is mirrored by comments from our interviewees. One Pro Vice-Chancellor asserted

The *Industrial Strategy* talks about developing a technical route for those not going to university. This is a misunderstanding: we need technical education for university students as well. (Sal Jarvis, University of Hertfordshire)

Kate Sugden, Associate Dean in Aston University's School of Engineering and Applied Science, debunked the perception that "Graduate engineers will never need to do anything practical, like solder a circuit":

the reality is most engineers will be talking to shop-floor manufacturing workers and technicians, and they need to be able to understand the issues they're facing and solve some of these problems ... It's important that students can do all the stuff and gain a good understanding of all different aspects of engineering.

The findings of this study support the suggestion that creating alternative 'technical' and 'academic' education routes may create a reductive opposition between the two which could ultimately impede the "whole-skills" approach advocated by UUK. In light of the need identified by the World Economic Forum's for "reskilling and upskilling talent from varied academic backgrounds in all industries" (2016, p.25).

An approach that treats technical education as something which sits entirely at school and college level – as an alternative to the pursuit of higher education – is not only self-defeating but runs counter to ... efforts on the ground, which are closely aligned to the needs of regional economies. (Latham, 2017)

Recommendations:

- + Research the impact of separating academic, technical and vocational routes at secondary level and in further/higher education, with particular regard to the successful realisation of the *Industrial Strategy*
- + Devise a means for government, industry and the higher education sector to work together to design a lifelong skills approach encompassing technical, conceptual, reflective and innovative capabilities across the whole workforce
- + Invite senior leaders from higher education institutions (including alternative providers and college HE) who are already using active, experiential and reflective teaching strategies in their curricula to join the Post-16 Skills Plan independent panel, to contribute to the advancement of the provision needed to develop outstanding future employees

7.5 Lifelong reskilling opportunities will need 'buy-in' from all stakeholders

A point emerging from the literature, which was also articulated by participants in this study, is the crucial necessity for all individuals to have access to flexible opportunities for re-skilling and up-skilling throughout the whole course of their working lives. This is echoed in the *Industrial Strategy* in its promise of "Creating opportunities for all throughout life" (p.115). In this light, the government's commitment to ensuring that "the education system for those aged 18 years and over is accessible to all ... and encourages the development of the skills that we need as a country" is welcome, as is the statement that this should be funded in a way that "works for students and taxpayers" (HMG, *Review of Post-18 Education and Funding: Terms of Reference*, p.1).

The senior HE leaders featured in this research concur. They argue that the traditional approach of 'front end-loading' education no longer supports the needs of a workforce that will change not only jobs, but careers; that instead a variety of shorter, flexible, 'bite-sized' educational provision at various levels will be required; that this provision should be available to workers of all ages, including up to the current retirement age; and that although such opportunities will be most valuable when co-designed between industry and academia, some employers are struggling to see the benefits of engaging with providers.

Creating a culture of lifelong, bite-sized skills development for worker in all sectors and at all levels presents some challenges. The Taylor Review notes that there has been a gradual decline in the level of training undertaken by those in work (2017, p.83) as well as a culture of individual responsibility in some sectors for employees to maintain an up-to-date skillset (p.86). In addition, unequal access to training opportunities appears to be built in to the system: "those already highly skilled are four times more likely to get training at work" (p.86).

In a post for the IPR blog, Pearce argues that employers currently have little incentive for supporting the skills development of their staff:

There is considerable evidence that UK employers do not appropriately utilise the skills of their employees and do not integrate skills into the design of job roles and business capital investment strategies. In a flexible labour market with high employment rates, employers have less incentive to invest in skills training ... (2017)

However, the need to embrace a culture change around supporting skills development appears crucial. The World Economic Forum has argued that “it is simply not possible to weather the current technological revolution by waiting for the next generation’s workforce to become better prepared. Instead it is critical that businesses take an active role in supporting their current workforces through re-training ...” (2016, p.v)

The Taylor Review too notes that the responsibility both for creating, and for maintaining, a skilled workforce must be a shared endeavour:

We must equip our children and young people to enter the labour market successfully, but Government, employers and individuals also need to make sure everyone is best placed to thrive throughout what might be a working life spanning 50 years or more. (2017, p.83)

Recommendation:

- + Ensure both higher education institutions and employers are supported to share responsibility for enabling access to flexible, lifelong reskilling.

7.6 A shared language of employability has yet to emerge

Evidence from the literature suggests that corresponding and connected terms around employability are used differently by different stakeholders. What might appear to be a transparent, shared language of skills, attributes, and competencies may in fact mask widely different understandings of how this terminology translates into capabilities, and indeed how those capacities manifest in practice and at different levels of experience and seniority.

Crucially, we should not assume that a particular term has the same meaning ... in these different levels of discourse. Nor, arguably, should we assume that a particular term, used as a technical concept, has the same meaning when used within a particular level of discourse by different stakeholders. (Holmes, 2013, p.539)

A further complication, beyond the need to identify or articulate the particular skills needed, is finding an appropriate generic label to call them by. The term ‘skills’ has been employed throughout this report in order to align with the *Industrial Strategy*. However, its value as a catch-all label for the kinds of complex cognitive and non-cognitive abilities we seek to foster in graduates has been brought into question (see, for example, Knight and Yorke, 2003; Holmes, 2012).

Our findings suggest there may be value in exploring a more layered approach which would allow us to distinguish between types or levels of ability – skills, attributes and competencies. Study participants spoke of ‘advanced skills’, ‘meta-skills’, and ‘meta-competencies’, suggesting the need for a spectrum or range of abilities. One interviewee made a clear distinction between ‘attributes’ and ‘competencies’ in the professional application of her subject field; another perceived the term ‘competence’ as itself comprising several complex elements.

This approach is in line with the seminal research conducted by Knight and Yorke (2003), who separated the concept of employability into four strands: understanding, subject and generic skills, self-efficacy, and metacognition. The findings of this study cast further light on the sheer range as well as the complexity of these elusive abilities, and show the importance of continuing, in partnership, to develop a terminology that goes beyond the simple, generic ‘skills’ level which does not adequately capture what employers need, nor what graduates bring.

The interviews and case studies suggest that HEIs are consciously changing how they talk about employability to students – and when. Participants explained the importance of integrating employability discourse into the curriculum at every level, rather than leaving it until the final year or ‘bolting on’ a generic module. They also emphasised how the practical application of subject knowledge forms the basis of much of their teaching, so that “the skills come first and then the empirical knowledge is attached to that” (Helen

Higson, Aston University). The use of problem-based learning, collaborative problem-solving, and design-focused techniques such as CDIO (conceive – design – implement – operate), together with meaningful work placements, live projects, and teaching input from industry experts, enable lecturers and course designers to talk to both students and employers in terms of what their graduates can do and contribute, rather than in a generic ‘employability’ language.

The fruitful collaborations between industry and academia outlined in this report have enabled HEIs to develop and improve the terminology in which they describe their graduates’ skills and future employability in ways that align more closely with employer needs and industry practices. HEIs have therefore learned to express the skills they develop in their graduates in ‘employers’ language’ rather than “HE language” (Lynette Ryals, Cranfield University), and thus align their discourse more closely with industry practices and employer needs. While this is not yet the “commonly understood spine of employability” envisaged by the Taylor Review (2017, p.86), it moves the conversation forward to a point where such a spine could begin to be developed.

Recommendations:

- + Build on successful educational collaborations and conversation between employers and higher education institutions to develop a meaningful and nuanced terminology that articulates attributes and values as well as skills, and takes into account the differences in how these may be applied in various sectors
- + Expand this conversation to include the views of other stakeholders: students, local enterprise partnerships and government

8. References

- Aghion, P. *et al.* (2013) *Investing for Prosperity: skills, infrastructure and innovation*. London.
- Andrews, J. and Higson, H. (2008) 'Graduate Employability, "Soft Skills" Versus "Hard" Business Knowledge: A European Study', *Higher Education in Europe*, 33(4), pp. 411–422. doi: 10.1080/03797720802522627org/10.1080/03797720802522627.
- Andrews, J. and Higson, H. (2014) 'Is Bologna Working? Employer and Graduate Reflections of the Quality, Value and Relevance of Business and Management Education in four European Union Countries', *Higher Education Quarterly*. doi: 10.1111/hequ.12054.
- Björck, V. and Johansson, K. (2018) 'Problematising the theory–practice terminology: a discourse analysis of students' statements on Work-integrated Learning', *Journal of Further and Higher Education*. Routledge, pp. 1–13. doi: 10.1080/0309877X.2018.1483016.
- Bunce, L., Baird, A. and Jones, S. E. (2017) 'The student-as-consumer approach in higher education and its effects on academic performance', *Studies in Higher Education*, 42(11), pp. 1958–1978. doi: 10.1080/03075079.2015.1127908.
- Competition and Markets Authority (2017) *University improves its approach to dealing with course changes*. Available at: <https://www.gov.uk/government/news/university-improves-its-approach-to-dealing-with-course-changes> (Accessed: 17 August 2018).
- Crafts, N. (2017) 'A New Industrial Strategy: Making Britain Great Again?', *The Political Quarterly*. Wiley/Blackwell (10.1111), 88(2), pp. 315–319. doi: 10.1111/1467-923X.12362.
- de la Torre, E. M., Rossi, F. and Sagarra, M. (2018) 'Who benefits from HEIs engagement? An analysis of priority stakeholders and activity profiles of HEIs in the United Kingdom', *Studies in Higher Education*. doi: 10.1080/03075079.2018.1479847.
- Department for Education (2016) *Post-16 Skills Plan (Cm 9280)*. London.
- Dowler, R. (2017) *A tentative, 'me-too' approach to industrial strategy will lead us nowhere*, *LSE Business Review*. Available at: <http://blogs.lse.ac.uk/businessreview/2017/06/14/a-tentative-me-too-approach-to-industrial-strategy-will-lead-us-nowhere/> (Accessed: 28 August 2018).
- Exley, S. (2016) *Sainsbury review: what changes are on the way for post-16 education?*, *TES News*. Available at: <https://www.tes.com/news/sainsbury-review-what-changes-are-way-post-16-education> (Accessed: 28 August 2018).
- Fai, F. (2018) *A view of Brexit and its impact on industrial strategy*, *IPR Blog (University of Bath)*. Available at: <http://blogs.bath.ac.uk/iprblog/2018/05/02/a-view-of-brexit-and-its-impact-on-industrial-strategy/> (Accessed: 17 August 2018).
- Fothergill, S., Gore, T. and Wells, P. (2017) *Industrial Strategy and the Regions : the shortcomings of a narrow sectoral focus*. Discussion Paper, Sheffield Hallam University.
- García-Aracil, A., Monteiro, S. and Almeida, L. S. (2018) 'Students' perceptions of their preparedness for transition to work after graduation'. *Active Learning in Higher Education*. doi: 10.1177/1469787418791026.

- Gray, A. (2016) *The 10 skills you need to thrive in the Fourth Industrial Revolution*, World Economic Forum. Available at: <https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/> (Accessed: 17 August 2018).
- Hammonds, W. (2017) *Course changes and consumer rights*, Universities UK blog. Available at: <https://www.universitiesuk.ac.uk/blog/Pages/Course-changes-and-consumer-rights.aspx>.
- Hanney, R. (2018) 'Doing, being, becoming: a historical appraisal of the modalities of project-based learning', *Teaching in Higher Education*. doi: 10.1080/13562517.2017.1421628.
- Health Education England (2018) *Preparing the healthcare workforce to deliver the digital future: the Topol Review - a call for evidence*.
- Higson, H. (2018) *Provider, employer and learner: the changing dynamic*, National Centre for Universities and Business blog. Available at: <http://www.ncub.co.uk/blog/provider-employer-and-learner-the-changing-dynamic> (Accessed: 17 August 2018).
- HM Government (2018) *Review of Post-18 Education and Funding Terms of Reference*. Available at: <https://www.gov.uk/government/publications/review-of-post-18-education-and-funding-terms-of-reference> (Accessed: 17 August 2018).
- HM Government (2017) *Industrial Strategy: building a Britain fit for the future*. doi: 10.1787/9789264266490-en.
- Holmes, L. (2013) 'Competing perspectives on graduate employability: possession, position or process?', *Studies in Higher Education*, 38(4), pp. 538–554. doi: 10.1080/03075079.2011.587140org/10.1080/03075079.2011.587140.
- Jones, C. M., Green, J. P. and Higson, H. E. (2015) 'Do work placements improve final year academic performance or do high-calibre students choose to do work placements?', *Studies in Higher Education*, 42(6), pp. 976–992. doi: 10.1080/03075079.2015.1073249org/10.1080/03075079.2015.1073249
- Jones, R. and Wilsdon, J. (2018) *The Biomedical Bubble: why UK research and innovation needs a greater diversity of priorities, politics, places and people*. NESTA.
- Kane, G. C. et al. (2015) *Strategy, not Technology, Drives Digital Transformation: becoming a digitally mature enterprise*.
- Knight, P. T. and Yorke, M. (2003) 'Employability and good learning in higher education', *Teaching in Higher Education*. Online, 8(1), pp. 3–16. doi: 10.1080/1356251032000052294org/10.1080/1356251032000052294.
- Latham, J. (2017) *More than a vote of confidence - making the industrial strategy work*, WonkHE blog. Available at: <https://wonkhe.com/blogs/more-than-a-vote-of-confidence-making-the-industrial-strategy-work/> (Accessed: 17 August 2018).
- Martin, I. (2018) *A fresh look at a national skills strategy*, Wonkhe | Comment. Available at: <https://wonkhe.com/blogs/a-fresh-look-at-a-national-skills-strategy/> (Accessed: 17 August 2018).
- Mennell, J. (2017) *Here we Cumbria: modern universities and the industrial strategy*, MillionPlus blog. Available at: <http://www.millionplus.ac.uk/news/blog/here-we-cumbria-modern-universities-and-the-industrial-strategy> (Accessed: 27 August 2018).
- Moon, J. A. (2013) *Reflection in learning and professional development: theory and practice*. Routledge.

- Ohtani, K. and Hisasaka, T. (2018) 'Beyond intelligence: a meta-analytic review of the relationship among metacognition, intelligence, and academic performance', *Metacognition and Learning*, 13(2), pp. 179–212. doi: 10.1007/s11409-018-9183-8.
- Pearce, N. (2017) *The UK's Industrial Strategy needs to be more than repackaged pet projects*, IPR Blog (University of Bath).
- Ryan, G. (2018) *T levels: what we know so far*, Tes News. Available at: <https://www.tes.com/news/t-levels-what-we-know-so-far> (Accessed: 17 August 2018).
- Sibley, J. et al. (2014) *Getting started with team-based learning*.
- Stuart, M. and Shutt, L. (2018) *How should universities respond to 21st century challenges?*, WonkHE. Available at: <https://wonkhe.com/blogs/how-should-universities-respond-to-21st-century-challenges/> (Accessed: 28 August 2018).
- Taylor, J. (2018) *It really isn't time for T levels*, Tes News. Available at: <https://www.tes.com/news/it-really-isnt-time-t-levels> (Accessed: 17 August 2018).
- Taylor, M. et al. (2017) *Good work: the Taylor review of modern working practices*.
- Tholen, G. (2018) 'The limits of higher education institutions as sites of work skill development, the cases of software engineers, laboratory scientists, financial analysts and press officers', *Studies in Higher Education*, pp. 1–12. doi: 10.1080/03075079.2018.1490894org/10.1080/03075079.2018.1490894.
- Universities UK (2018) *Solving future skills challenges*. London.
- Valero, A. and Davies, R. (2017) *Towards a modern UK industrial strategy*, LSE Business Review. Available at: <http://blogs.lse.ac.uk/businessreview/2017/09/19/towards-a-modern-uk-industrial-strategy/> (Accessed: 21 August 2018).
- Vorley, T. and Knetch, M. (2017) *Seeing and doing the social science in the Industrial Strategy*, ESRC blog. Available at: <https://blog.esrc.ac.uk/2017/11/27/seeing-and-doing-the-social-science-in-the-industrial-strategy/> (Accessed: 17 August 2018).
- White, C. and Wilkinson, B. (2017) *Creating, not picking, winners: How to develop an industrial strategy which works for everyone*. Policy Institute, King's College London.
- Williams, C. (2010) 'The discursive construction of the "competent" learner-worker: from key competencies to "employability skills"', *Studies in Continuing Education*. Taylor & Francis, 27(1), pp. 33–49. doi: 10.1080/01580370500056422.
- Wilsdon, J. and Jones, R. (2018) *Rethinking the life sciences strategy*, Wonkhe. Available at: <https://wonkhe.com/blogs/rethinking-the-life-sciences-strategy/> (Accessed: 17 August 2018).
- Wilson, T. (2012) *A review of business-university collaboration: the Wilson review*.
- Wolf, A. (2011) *Review of vocational education: the Wolf Report*.
- World Economic Forum (2016) *The future of jobs: employment, skills and workforce strategy for the Fourth Industrial Revolution*.



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